

Some Japanese biting midges breeding in paddy-field water (Diptera, Ceratopogonidae)

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It is well known that many Chironomids breeding in the water of the paddy-field in Japan but biting midges (Ceratopogonidae) are little known, except for our report on *Culicoides arakawae* (1961, Sci. Rept. Kyoto Pref. Univ. Agr. 13 : 53-59). In this time I intend to report biting midges mainly reared up to the imagoes from the larvae collected from the paddy-field water by Dr. Sigeo Kitaoka, to whom I am indebted for the opportunity of examining his collection.

Abbreviations used in the text are as follows. AR (antennal ratio) shows the combined length of distal 5 segments X-XIV to that of basal 8 II-IX taken together. CR (costal ratio) shows the length of the costal vein to that of wing both measured from the incision between the alula and squama. CRL is combined relative length of several successive segments. PR (palpal ratio) shows the length of palpal segment III to the width of the broadest part of the segment. RL (relative length) is measured by an ocular micrometer under magnification of 150 (1 unit=0.013 mm) in the case of wings, wing veins, proboscis, head-capsule and leg segments and under magnification of 600 (1 unit=0.003 mm) in the case of antennae, maxillary palpi, leg or tarsal segments of some minute insects, spermathecae and male hypopygium. RL-A is the relative lengths of antennal segments (Arabic numeral prefixed before A shows the number of apical antennal segments). RL-L is the relative lengths of leg segments, excluding coxae and trochanters. RL-T is the relative lengths of tarsal segments of legs. RL-V is the relative lengths of wing veins R, M, stem of fMCu, R₁ and Rs. TR (tarsal ratio) shows the relative length of tarsal segment I to II. W is the relative width of the broadest part measured in the perpendicular position to the long axis. Roman numeral shows the ordinal number of segment of antenna, palpus, tarsus, etc., and in the case of the wing, the first and second radial cell and the first to third costal pale or dark spot and band.

1. *Dasyphelea arciforceps* Tokunaga, 1940, Tenthredo 3 : 129 (Fig. 1)

Rather small dark brown species; scutellum pale yellow, halter yellowish; antenna without terminal stylet in both sexes, male antenna with surface sculpture and XI-XIII binodose, female antenna without sculpture, AR 0.82-0.89; scutellum with median setae 4-6 large and 2-5 small; legs mainly brown to

pale brown, tarsi pale yellow, hind TR 2.18-2.41; wing with radial cell II very small or obscure, stem vein of radial cell simple. Male hypopygium with styles slender and arcuate; anal points very long; aedeagus complicate, with median strong sclerite; parameres symmetrical, with median lobe very small. Female subgenital plate with oval or flattened cordiform basal ring; spermatheca single, oval or subspherical.

Male: Body 1.63-1.65 mm long. Wing $0.95-1.08 \times 0.29-0.34$ mm. Head dark brown, eyes contiguous, mouth parts pale ochreous. RL-P 2.5 : 7.5 : 20 : 10.8 : 10.3. Antenna entirely dark brown, flagellum with striation and reticulation, but without terminal stylet, XI-XIII binodose, CRL of II X to XI-XIV 93 : 98, RL-8A 9.3 : 9.5 : 10.5 : 10.5 : 26 : 27 : 23 : 24.5. Thorax mainly dark brown, scutum somewhat paler on humeral and lateral areas, scutellum pale yellow, with 5-6 large and 2-3 small median setae besides 2 large lateral setae. Legs mainly brown or pale brown, tarsi pale yellow; hind tibial comb with 5-7 apical bristles; TR 2.2-2.35 in fore, 2.29-2.54 in mid, 2.19-2.32 in hind.

Wing with macrotrichia spread almost all over surface, but bare areas along veins wide, CR 0.5-0.54, RL-V 24 : 21 : 36 : 7 : 10, radial cell II very small, square in outline, with oval inner space, its stem single-veined, fMCu under costal end. Halter with knob yellow, stem brown. Abdomen entirely dark brown, sternites irregularly atrophied. Hypopygium (Fig. 1) with tergite subtriangular, anal point long, rod-like; sternite pubescent on caudolateral parts, with hyaline caudal lobe beneath aedeagus; coxite subcylindrical, style slender, arcuate, slightly shorter than coxite (28 : 31), 2.5 as long as anal point (28 : 11); aedeagus rather large, with 2 unequal hook-like lateral lobes on either side, 1 similar dark median lobe; parameres symmetrical, median lobe indistinct, probably very short.

Female: Body 1.43-1.63 mm long. Wing $0.82-0.98 \times 0.35-0.39$ mm. General color and structure as in ♂. RL-P 3+7 : 17 : 8.5 : 9. Antenna entirely dark brown, without surface sculpture, II-VI round to short-oval, VII-IX oval to elongate-oval, X-XIV elongate-oval, flagellar segments gradually elongated apically, no abrupt change between segments IX and X, AR 0.83-0.89, RL-8A 9.5 : 9.5 : 10 : 11.3 : 11.8 : 11.9 : 11.4 : 17.5 (W=6.7). Scutellum with 4-6 large and 3-5 small median setae besides 2 lateral. Legs with TR 2.08-2.17 in fore, 2.16-2.28 in mid, 2.18-2.41 in hind, hind tibial comb with 5-6 apical bristles.

Wing with rather dense macrotrichia spread all over surface but bare areas along veins distinct, CR 0.51-0.52, RL-V 19.5 : 15 : 29 : 7 : 12.5, radial cell II small, inner space obscure, fMCu under tip of R_1 . Abdominal tergites brown, sternites paler, subsquare, with about 12 setae on caudal margin; cerci pale brown; subgenital plate with oval or subcordiform basal ring, tapered caudal arms and V-shaped caudal incision; spermatheca single, short-oval or subspherical (18×14.3), with curved neck part.

Specimens examined : 3♂, 3♀, Kokubunji, Kitatama, Tokyo, 1-10 VI 1962, Kitaoka; 1♂, Kodaira, Kanagawa, 7 IX 1961, Kitaoka.

Distribution : Japan (Honsyu).

This is highly specific in the structure of the aedeagus of male hypopygium and of female subgenital plate.

2. *Dasyhelea kyotoensis* Tokunaga, 1940, Tenthredo 3 : 132

Specimens examined : 1 ♂, 2 ♀, Kokubunji, Tokyo, 13-V-1962, Kitaoka.

Distribution : Japan (Honsyu and Ryukyu).

3. *Dasyhelea flaviventris* Goetghebuer, 1910, Bull. Soc. Ent. Namur 12 : 95 ; 1920, Men. Mus. Roy. Hist. Nat. Belg. 8 : 41 ; Remm, 1962, Tartu Riikliku Ülikooli Toimetised (Zooloogia-Alaseid Töid II) 120 : 127. (Fig. 2)

Specimen examined : 1 ♂, Kodaira, Kanagawa, 7 IX 1961, Kitaoka.

Distribution : Europe and Japan (Honsyu, Kyusyu and Ryukyu).

This species and *kyotoensis* are very closely allied to each other, however, recently Remm (1962) reported details of the male hypopygium of *flaviventris*. Referring to his report, I have re-examined Japanese species identified as *flaviventris* by myself and intend to correct my reports as follows : the males of *flaviventris*, from Honsyu and Kyusyu reported on Tenthredo 3 : 132 (1940) and from Ryukyu on Pacif. Ins. 4 : 199 (1962) are of *kyotoensis* Tokunaga.

Both sexes of *kyotoensis* are far darker or more brownish than in *flaviventris*, especially so in the color of the scutum, and the males of these 2 species are distinctly different in the structures of the hypopygium : in *flaviventris*, styles with preapical concavity and sternite with caudomedian projections (Fig. 2), while in *kyotoensis*, styles and sternite simple. Females of both species are rather variable in color and very closely similar, except for scutal color, to each other (both species without basal ring-like structure of the subgenital plate).

4. *Dasyhelea centridorsalis* Tokunaga n. sp. (Fig. 3)

Large dark brown species with rather dense dark hairs ; antenna with blunt terminal stylet, palp distinctly 5-segmented ; scutum with tuft of setae at central part, scutellum with 10 large and 6-10 small setae ; mid leg with 2 apical spines on each tarsal segment of I-IV, TR of all legs about 1.7-1.8 ; wing almost entirely hairy, stem of radial cell II double-veined ; male hypopygium with claw-like styles, anal points rudimental, aedeagus with large ventral floor, parameres symmetrical, with median lobe sharply pointed and shorter than basal arms ; female subgenital plate with trapezoid ring and spatulate basal sclerite, spermathecae double, almost round, each with very slender chitinated part of duct.

Male : Body 3.02 mm long, dark brown and setigerous. Wing 1.94×0.61 mm. Head dark. Palp brown, 5-segmented (8 : 12 : 26 : 24 : 20). Antenna entirely dark brown, surface striation well developed but reticulation absent, CRL of II-X to XI-XIV 157 : 147, RL-8A 15 : 15 : 16 : 18 : 44 : 35 : 28 : 36, XIV with blunt apical stylet, XI-XIII binodose. Thorax extensively dark brown, scutum with subsquare caudoscuteal area yellowish, tuft of dark setae at centre, scutellum fuscous yellow, with 10 large setae along caudal margin and several small

setae on midprothion. Legs with coxae and trochanters dark brown, following 2 segments and last one brown, tarsal segments I-IV almost white; hind tibial comb with 6 apical bristles, mid leg with 2 apical spines on each tarsal segment of I-IV; TR and RL-L 1.72 and 46 : 47 : 25 : 14.5 : 10 : 7 : 8 in fore, 1.73 and 60 : 55 : 28.5 : 16.5 : 11 : 7.5 : 8 in middle, 1.68 and 58 : 56 : 32 : 19 : 13 : 9 : 8.5 in hind.

Wing with veins brown, macrotrichia decumbent, densely spread almost all over surface, bare areas along veins present; costa ending before tip of Cu_1 , CR 0.58, RL-V 41 : 36 : 59 : 20 : 29, radial cell II ending squarely, about 1/2 as long as its double-veined stem (8 : 16), r-m longer than M_{1+2} (7 : 5), fMCu before end of R_1 . Halter fuscous brown. Abdomen with tergites dark brown, with many small pale spots at setal bases, sternites subdivided into paired brown hemisternites, membranes yellowish, pleural sides with large dark clouds. Hypopygium (Fig. 3) dark, with styles claw-like, slightly shorter than coxite (45 : 50); aedeagus with large bell-shaped floor, basal arch about 1/2 of total length, lateral sclerites slender; parameres slender, with median lobe sharply pointed, curved ventrad, shorter than lateral arms (30 : 38).

Female : Body 2.69 mm long, with color and structure generally as in ♂. Wing 1.76×0.66 mm. Eyes widely contiguous; clypeus with 7 lateral setae, proboscis about 0.4 as long as head-capsule. RL-P 7 : 12 : 21 : 20 : 20. Antennal segment I dark, III-V ochreous, other segments largely brown, II IX round to short-oval, X-XIV elongate oval, without surface sculpture; AR 0.85, RL-8A 13 : 13.5 : 14.5 : 17 : 18 : 19 : 19 : 24 ($W=10-11$). Scutellum with 10 small median setae besides 10 large setae. Hind tibial comb with 5-6 apical bristles; TR and RL-L 1.76 and 49 : 42 : 22 : 12.5 : 9 : 6.5 : 7.5 in fore, 1.73 and 52 : 53 : 25 : 15 : 10 : 7 : 7 in mid, 1.67 and 49 : 51 : 30 : 18 : 12 : 8 : 8 in hind.

Wing more densely hairy than in ♂, bare areas along veins present but not distinct; costa ending beyond tip of Cu_1 , CR 0.61, RL-V 38 : 33 : 50 : 20 : 33, radial cell II about 0.6 as long as its double-veined stem (12 : 19), r-m to M_{1+2} 8 : 6, fMCu under midportion of R_1 . Abdomen with tergal pale spots at setal bases not distinct differing from ♂; cerci brown; subgenital plate with trapezoid ring and isolated spatulate basal sclerite; spermathecae double, brown, almost round, $5+19 \times 17.5$ and $6+18 \times 15$, each with very slender chitinized part of duct.

Holotype : ♂, Kokubunji, Kitatama, Tokyo, 26 IV-1962, Kitaoka. *Allotype* : ♀ with type.

Distribution : Japan (Honsyu).

General appearance of this insect is similar to that of Micronesian un-named sp. No. 3, but the presence of antennal terminal stylet and of double functional spermathecae are quite different specific characters from the similar species. Other allied species may be Micronesian *multifascia* Tokunaga and Murachi, except for differences of various parts, but from which the new species may be distinguished by the following characters: AR smaller than

1.0, female subgenital plate with basal elongate sclerite and vestigial spermatheca not round.

5. *Dasyhelea densipilosa* Tokunaga n. sp. (Fig. 4-5)

Medium-sized dark brown species, scutellum, tarsal segments and halteres yellow or pale. Scutellum with 15-17 setae on middle part; TR of all legs 1.9-2.2, wing with hairs densely spread almost all over surface, radial cell I slit-like, as long as II, male hypopygium with styles slender, almost straight, parameres symmetrical, without anal points; female with subgenital plate subtriangular on basal 1/2, spermatheca short-oval, without chitinized part of duct.

Male: Body about 2.05 mm long. Wing 1.39×0.4 mm. Head dark brown, mouth parts pale, clypeus with 6-8 setae, eyes almost contiguous. RL-P 14 : 30 : 14 : 14. Antenna entirely dark brown, with striation developed, reticulation almost absent, XI-XIII binodose, XIV rather pointed at tip, CRL of II-X to XI-XIV 120 : 128, RL-8A 11 : 11.5 : 12 : 13 : 36 : 33.5 : 28 : 27. Thorax dark brown, scutellum paler, with 15 median and 2 lateral setae. Legs largely brown, knees dark, tarsal segments I-IV almost white; hind tibial comb with 6 apical bristles; TR-T 1.95 and 76 : 39 : 27 : 22 : 20 in fore, 1.89 and 83 : 44 : 29 : 22 : 21 in mid, 1.98 and 97 : 49 : 32 : 23 : 23 in hind.

Wing with veins brown, macrotrichia densely spread, CR 0.52, RL-V 32.5 : 27 : 47.5 : 7 : 14, radial cell I slit-like, II elongate, as long as I (5 : 5), fMCu under tip of R₁. Halter pale but base dark brown. Abdomen dark brown, sternites III-V irregularly reduced, VI-VIII subsquare, with 12-14 setae on caudal margin. Hypopygium (Fig. 4) without prominent anal points, coxite short, style slender, almost straight, sternite with blunt tubercle on either side of caudal median depression; tergite round on caudal margin; aedeagus with caudolateral lobes tapered, curved at apices, basal arch very shallow; parameres almost symmetrical, basal arms rather broad, median lobe longer than basal arms, tapered gradually or suddenly on apical 1/4.

Female: Body 2.02-2.08 mm long. Wing $1.11-1.24 \times 0.4-0.46$ mm. Color generally as in ♂. Head with RL-P 11.5 : 25 : 10 : 12.5; clypeus with 8-10 setae. Antenna dark brown, II-IX round to oval, X-XIV subcylindrical, without striation and reticulation, XIV with blunt apical tip; AR 0.89-0.9, RL-8A 11.5 : 12 : 12.3 : 15.3 : 15.8 : 17 : 15.5 : 21.8 (W=6.8-7.5). Scutum with lateral margins, humeral areas and foveae pale brown, scutellum pale ochreous, with 2 lateral and 14-16 median setae. Legs as in ♂ in color, hind tibial comb with 5-6 apical bristles; TR and RL-T 2.0-2.07 and 63 : 31 : 22 : 17.5 : 18 in fore, 1.9-2.0 and 71.5 : 36 : 23.5 : 17.5 : 18 in mid, 2.0-2.22 and 85 : 40.5 : 28.5 : 18 : 18 in hind.

Wing with dense macrotrichia, bare areas along veins obscure, CR 0.55, RL-V 24.5 : 20.5 : 37 : 8.8 : 16.3. 2 radial cells equal in length, I slit-like, fMCu under base of radial cell II. Halter with knob yellow. Abdomen with band-like tergites, sternite II irregularly atrophied, other posterior subsquare, with 28-34 setae, pleural membranes fuscous, intersegmental yellow, cerci brown,

spermatheca (Fig. 5) single, large, brown, round, 19.5×19.5 , without chitinized part of duct; subgenital plate (Fig. 5) with basal part triangular, without ring-like structure.

Holotype: ♂, Kokubunji, Kitatama, Tokyo, 20 V-1962, Kitaoka. *Allotype*: ♀ with type. *Paratypes*: 1 ♀ with type; 2 ♂, 4 ♀, Kokubunji, Kitatama, Tokyo, IV-VI-1962; 1 ♂, Omiya, Saitama, 22-VIII-1961, Kitaoka.

Distribution: Japan (Honsyn).

This is allied to Micronesian *subperfidia* Tokunaga in general appearance but the allied species is somewhat different in the following characters: In the male, CRL of antennal segments II-X and XI-XIV subequal, scutellum with only 10 setae at most, TR far larger being 2.7 in fore, 2.8 in mid, 2.58 in hind leg, hypopygium with median lobe of parameres far longer. In the female, last antennal segment relatively longer being about 1.6 as long as penultimate, AR only 0.81, scutellum with at most 11 setae, TR larger being 2.55 in fore, 2.73 in hind. In both sexes, wing without radial cell I.

6. *Dasyhelea kitaokai* Tokunaga n. sp. (Fig. 6)

Medium-sized dark brown species very closely similar to *densipilosa* n. sp., from which may be distinguished by less setigerous scutellum, smaller TR of all legs, small median lobe of parameres and absence of tubercles of sternite IX of male hypopygium. Female not known.

Male: Body 1.79 mm long. Wing 1.2×0.38 mm. Head dark brown, eyes widely contiguous, mouth parts ochreous, clypeus with 8 setae. RL-P 9:25:10:11. Antenna entirely dark brown, without reticulation, VI-XIV with surface striation, XI-XIII binodose, CRL of II-X to XI-XIV 105:111, RA-8A 10:11:11.5:12:31:31.5:25:21, XIV with blunt tip. Thorax dark brown, scutellum yellow, with 2 lateral and 7 median setae. Legs largely brown, but tarsal segments I-IV yellow; hind tibial comb with 7 apical bristles; TR and RL-T 1.8 and 54:30:20:15:15:15 in fore, 1.86 and 65:35:23:16:15 in mid, 1.97 and 77:39:28.5:18:19 in hind.

Wing entirely hairy with long trichia, bare areas along veins absent, veins ochreous; costa ending before tip of Cu_1 , CR 0.54, RL-V 26:22:46:9:16, radial cell I slit-like, longer than II (7:5), fMCu under septum of radial cells. Halter with base of stem brown, knob yellow. Abdomen dark brown, without distinct intersegmental pale bands, pleural membranes infuscate, sternites I-V reduced into paired small sclerites, other sternites subsquare, with many setae. Hypopygium (Fig. 6) dark brown; tergite without prominent anal points, sternite pubescent around bases of coxites; style slender, very slightly curved, somewhat longer than coxite (28:26); aedeagus with basal arch very shallow, paired caudal lobes small, sharply pointed; parameres symmetrical, with median lobe sharply pointed, longer than basal arms but shorter than style (25:21:28).

Holotype: ♂, Kokubunji, Kitatama, Tokyo, 20 V 1962, Kitaoka.

Distribution: Japan (Honsyu).

This is very closely allied to *densipilosa* n. sp., from which, however, may be separated by the distinct difference of the male hypopygium and in the following points : ultimate antennal segment far shorter than penultimate and scutellum with only 7 median setae.

7. *Stilobezzia zonata* Tokunaga n. sp. (Fig. 7)

Medium-sized yellow and brown species; thoracic tergites brown and other parts widely yellow, abdominal tergites IV-VI (♂) or III-VI (♀) brown and other parts largely yellow, legs extensively white, femoral and tibial ends of mid and hind legs brownish; wings without markings, radial cell I present but small. Male hypopygium with aedeagal sclerites slender, without pointed tips, parameres stout, blunt at apices, with basal sclerites small. Spermathecae very unequal, round, larger one without chitinized part of duct.

Male : Body 1.76 mm long. Wing 1.25×0.36 mm. Head mainly pale yellow, with vertex brown. Eyes bare and contiguous. Palp slender, RL-P 5 : 10 : 14 : 11 : 19. Antenna with I brown, other segments and plumose hairs pale brown, CRL of II-XI to XII-XIV 157 : 163, RL-8A 13 : 13 : 13 : 14 : 16 : 43 : 45 : 73. Thorax with tergites, fore and hind pleural sides brown, other parts yellow, scutellum with 2 median and 2 lateral setae. Legs mainly whitish, apical ends of mid and hind femora slightly brownish; hind tibial comb with 8-9 apical bristles, claws cleft at extreme tips, tarsal spines present only on mid leg, 1 sub-basal and 2 apical on I, 2 apical on II; TR and RL-L 2.4 and 31.5 : 32 : 18 : 7.5 : 2.7 : 2.5 : 3.8 in fore, 2.76 and 40 : 39 : 26 : 9.5 : 3 : 2.5 : 3.8 in mid, 2.11 and 36.5 : 38 : 19 : 9 : 3 : 2.5 : 4.5 in hind leg.

Wing entirely white, macrotrichia absent; costa ending before tip of M_{3+4} , CR 0.69, RL-V 34 : 34 : 45 : 6 : 24, M_{1+2} about $4 \frac{2}{3}$ of r-m, radial cell II $4 \frac{1}{4}$ of I, Cu_1 ending anal margin with right angle, fMCu under radial septum. Halter with knob brown, stem pale yellow. Abdomen with tergites IV-VI brown, III with pale brown band along anterior margin, other parts yellow; tergite I with 5-6 setae on either lateral side. Hypopygium (Fig. 7) pale yellow; tergite without anal points, with cerci large; coxite conical, style arcuate, pointed, about $\frac{3}{4}$ of coxite (24 : 32); aedeagus with lateral sclerites slender, slightly broader on apical parts; parameres stout, as long as aedeagal sclerites (20 : 19), blunt at apices, with basal sclerites small.

Female : Body 1.85 mm long, with color as in ♂. Wing missing. Eyes narrowly separated. Mandible with 7-8 teeth. Palp white, RL-P 7 : 9 : 17 : 13 : 19. Antenna with I yellow on ventral and brown on dorsal side, II-IX yellow, each with neck part, X-XIV pale brown, AR 1.46, RL-8A 13.5 : 15 : 16 : 35 : 35 : 36 : 36 : 54 (W=6-7). Hind tibial comb with 9 apical bristles; tarsal spines : in fore, V with 2 ventral; in mid, I with 1 sub-basal and 2 apical, II with 2 apical, V with 2 ventral; in hind, V with 1 weakly developed ventral; TR and RL L 2.44 and 34.2 : 35 : 19.5 : 8 : 3 : 3 : 7 in fore, 2.86 and 45.5 : 44 : 28 : 9.8 : 3.5 : 3 : 7 in mid, 2.1 and 41 : 40 : 21 : 10 : 3.2 : 3 : 7 in hind.

Abdomen with tergites III-VI brown, other parts entirely yellowish; tergite I

with 4-5 setae on either side. Spermathecae round, very unequal; larger one brown, 20×20 , without chitinized part of duct; smaller paler, $5+9 \times 8$, with very slender chitinized part of duct; vestigial yellow, tubular, 6×0.8 . Other structures as in ♂ with usual sexual differences.

Holopyte: ♂, Omiya, Saitama, 22-V-1961, Kitaoka. *Allopyte*: ♀ with holotype.

Distribution: Japan (Honsyu).

This is somewhat allied to Micronesian *subsoror* Tokunaga, but from which may be easily distinguished by the differences of the male hypopygium, absence of macrotrichia of the wings and distinct bicolored abdomen of both sexes.

8. *Palpomyia ferruginea* Meigen, 1818, Syst. Besch. 6 : 265; Winnertz, 1852, Linn. Ent. 6 : 61; Kieffer, 1919, Ann. Hist. Nat. Mus. Nat. Hung. 17 : 102; Goetghebuer, 1920, Mem. Mus. Roy. Hist. Nat. Belg. 8 : 91.

P. fulva Macquart, 1826, Recueil Soc. Sci. Agr. Lille 1 : 181; 1926, Dipt. N. Fran. 1 : 125; Kieffer, 1925, Faune de Fran. 11 : 99; Edwards, 1926, Trans. Ent. Soc. Lond. II (1926) : 422. (Figs. 8~9)

Rather large pale brown species; legs mainly pale yellow, with all knee-parts and distal ends of tibiae more or less brownish, fore femur with 14-16 and other femora each with 3-4 spines on apical ventral parts, mid tibia with 1 apical spine; halter very pale; male hypopygium with tergite tapered, coxites and styles slender, aedeagus with large basal arch, parameres slender, as long as coxites, with funnel-like apical end.

Male: Body 3.9 mm long. Wing 2.43×0.73 mm. Head pale brown entirely, eyes just contiguous. Palp pale brown, RL-P 8 : 18 : 23 : 16 : ? Antennal segment I pale brown, XII-XIV brown, II-XI and plumose hairs yellow; CRL of II-X to XI-XIV and II-XI to XII-XIV 220 : 250 and 257 : 214, RL-8A 20 : 20 : 21 : 23 : 35 : 51 : 79 : 84. Thorax entirely pale brown, scutum with small blunt anterior tubercle and 4-5 supra-alar bristles, surface of scutum (Fig. 8) with moss-like impression and without microtrichia, scutellum with about 10 large and 3-4 small setae. Legs mainly pale yellow, but coxal, knee-parts and tibial ends somewhat brownish; fore femur slightly thickened, with 14-16 ventral spines on apical 1/2, other femora each with 3-4 ventral spines on apical 1/4, mid tibia with 1 apical spine; hind tibial comb with 9 apical bristles; tarsal spur-like apical spines: in mid, I-III each with 2; in hind, II-III each with 1; claws cleft at tips; TR and RL-L 1.37 and 69 : 62.5 : 28 : 15 : 9 : 7.5 : 12 in fore, 2.81 and 78 : 59 : 36.5 : 13 : 8 : 7 : 12 in mid, 2.23 and 77.5 : 64 : 43.5 : 19.5 : 9 : 7.5 : 14 in hind.

Wing entirely very pale, costa ending above midway between tips of M_2 and M_{3+4} , CR 0.82, RL-V 63 : 64 : 84 : 47 : 78, radial cell II about $1 \frac{1}{4}$ of I (41 : 33), fMCu under middle of radial cell I, Cu₁ ending under radial septum. Halter very pale, almost white. Abdomen pale brown. Hypopygium (Fig. 9) brown; tergite tapered distinctly, extending slightly beyond coxites; coxite rather slender; style small, slender, 0.76 as long as coxite (60 : 79); aedeagus very

broad, basal arch large, about $1/2$ of total length; parameres fused, fully as long as coxites, median lobe rod-like and funnel-like at end.

Specimen examined : 1 ♂, Kokubunji, Kitatama, Tokyo, 1-VI-1962, Kitaoka.

Distribution : Europe and Japan.

European male specimens are somewhat different from the present male in possession of more distinct darker parts of thorax and legs, less spinose fore femur (with 7 spines) and rather longer radial cell II (about 1.67 as long as I). The present male is thought to be immature being paler and the other 2 points may be due to specific local variation.

9. *Palpomyia tibialis* Meigen, 1818, Syst. Besch. 1 : 82; Winnertz, 1852, Linn. Ent. 6 : 65; Kieffer, 1919, Ann. Hist. Nat. Mus. Nat. Hung. 17 : 97; 1925, Faune de Fran. 11 : 96. (Fig. 10)

Large dark and yellow species; legs with femora largely yellow, but knee-parts brown or dark, tibiae brownish, but apical $1/3$ of hind femur and entire hind tibia black, femoral ventral spines 7-9 in fore, 1-2 in mid, 4 in hind; tarsal segments I-III yellow, IV-V brown, V with ventral spines : 1-2 in fore, 2 in mid, 4 in hind; spermathecae almost round and subequal.

Female : Body 4.03 mm long. Wing 2.8×0.92 mm. Head dark, mouth parts ochreous, eyes separated as wide as 1 facet, proboscis short, less than 0.5 of head-capsule. Mandible with 11 teeth apically larger. Palp ochreous, RL-P 13 : 24 : 30 : 18 : 22. Antennal segment I yellow, II-IX basally yellow and apically dark brown, X-XIV black; AR 1.86, RL-8A 20 : 20 : 23 : 59 : 64 : 66.5 : 72 : 84 (W=9-10). Thorax entirely dark, scutum with anterior tubercle small and blunt, 3 supra-alar bristles, decumbent setae and microtrichia (Fig. 10); scutellum probably with 4 bristles. Legs with coxae dark, trochanters and tarsal segments I-III yellow, IV-V brown, femora largely yellow but knee-parts and tibiae of fore and mid legs brown, preapical or midportion of tibiae more or less ochreous, apical $1/3$ of hind femur and entire hind tibia black; femoral spines : fore with 7-9 ventral on apical $3/4$, mid with 1-2 ventral on preapical part, hind with 4 slender ventral on apical $1/3$; mid tibia with 1 apical spine; tarsal spines : in fore, V with 1-2 ventral; in mid, I-III each with 2 apical, V with 2 ventral; in hind, IV with 1 apical, V with 4 ventral arranged in line; tarsal segments IV cordiform, claws equal, shorter than V, each with sharply pointed basal tooth. TR and RL-L 2.17 and 71 : 65 : 25 : 11.5 : 6 : 6 : 13 in fore, 3.14 and 90 : 79 : 44 : 17 : 7 : 6 : 13 in mid, 2.59 and 104 : 96 : 57 : 22 : 8 : 7 : 16.5 in hind.

Wing pale fuscous, costa ending slightly before tip of M_2 , CR 0.83. RL-V 73 : 73+3 : 83 : 42 : 6+86, r-m slightly shorter than basal section of Rs (5 : 6), radial cell II about 2.5 of I (61 : 25), fMCu under r-m, Cu₁ ending under radial septum. Halter with knob dark, stem ochreous. Abdomen dark brown, but basal 3 segments somewhat ochreous; cerci dark brown; spermathecae dark, round, subequal (35×40 , 35×35); gland rods probably present only on tergite VII and rather short.

Specimen examined : 1 ♀ Kokubunji, Kitatama, Tokyo, 2-VI-1962, Kitaoka.

Distribution : Europe and Japan (Honsyu).

10. *Bezzia kitaokai* Tokunaga n. sp. (Fig. 11)

Medium-sized dark brown species; legs largely yellow, but fore femur and tibia with yellow rings and tarsi very pale ochreous; fore femur with 2 spines, other femora without spines; scutellum with 4 large bristles; halter dark brown. Male hypopygium with styles slender and arcuate; aedeagus far longer than coxite, extending beyond coxites; parameres with median lobe slender, short, rod-like. Female unknown.

Male : Body 1.66 mm long. Wing 1.14×0.35 mm. Head dark brown, eyes just contiguous, mouth parts brown. Palp stout, RL-P 4 : 9 : 11 : 9 : 10. Antennal segment I brown, II-XI, base of XII and plumose hairs yellow, other parts brown, CRL of II-X to XI-XIV 135 : 99, RL-8A 12 : 13 : 15 : 21 : 36 : 17.5 : 20 : 25. Thorax almost entirely dark, but scutellum brown, anterior scutal tubercle absent, supra-alar setae 3, scutellum with 4 large and 10 small setae. Legs mainly dark brown, except for yellowish pale ochreous tarsi, fore femur with yellow preapical ring, fore tibia with sub-basal and preapical yellow ring, mid and hind tibiae with brown sub-basal cloud; fore femur with 2 ventral spines on apical 1/2, other femora without spines, mid tibia with 1 apical spine-like bristle, hind tibial comb with 4-5 apical bristles, claws cleft at tips; tarsal apical spines only on mid : I-III each with 1; TR and RL-L 2.4 and 29 : 25 : 12 : 5 : 3.2 : 3 : 5 in fore, 2.37 and 34 : 28 : 17.8 : 7.5 : 4 : 3 : 5 in mid, 2.38 and 38 : 34 : 19 : 8 : 4.8 : 3 : 5 in hind.

Wing almost entirely white, costa ending slightly before tip of M_{3+4} , CR 0.68, RL-V 26 : 27 : 34 : 12 : 27, Rs straight, fM at end of r-m, fMCu under midportion of R. Halter with knob dark brown, stem brown. Abdomen with tergites brown, sternites and pleural membranes very pale. Hypopygium (Fig. 11) dark brown; tergite small, slender, cerci elongate, ending at level of apices of coxites; coxite broad, style tapered, arcuate, far shorter than coxite (43 : 55); aedeagus with basal sclerite thickened, rather small, caudal lobe elongate, strongly extending caudad far beyond coxite, far longer than coxite (80 : 55); parameres fused, with basal sclerite strong, median lobe rod-like, only 0.4 as long as aedeagus (32 : 80).

Holotype : ♂, Kokubunji, Kitatama, Tokyo, 2-VI-1962, Kitaoka.

Distribution : Japan (Honsyu).

This is very closely allied to *micronyx* Kieffer from Taiwan and Ryukyu Is., except for rather distinct difference of the male hypopygium. In the allied species, however, may be distinguished from the present species by the following points : fore femur with 3-4 preapical spines instead of 2, TR of hind leg 2.56 being larger than 2.38, wing vein Rs far shorter than R (24 : 31) instead of subequal (27 : 26), besides the difference of the male hypopygium.

11. *Bezzia spinosa* Tokunaga, 1940, Tenthredo 3 : 161 (Fig. 12)

Medium-sized dark setigerous species; legs mainly dark, with narrow pale

yellow rings on preapical part of fore femur, sub-basal and preapical parts of fore tibia and preapical part of mid tibia, tarsal segments I-IV pale yellow, femora, tibiae and tarsal segment I-III with strong dark spine-like bristles on apical parts and mid and hind tibiae with 2-4 additional on midportion; hypopygium with styles small, subtriangular; tergite short; aedeagus with elongate median lobe; parameres fused, very long, far longer than coxites. Female not known.

Male : Body 2.93 mm long. Wing 1.83×0.48 mm. Head dark, eyes bare, separated as wide as 3 facets. Palp dark brown, RL-P 9 : 13 : 24.5 : 16 : 16. Antennal segments I and XII-XIV dark brown, II-IV and apical 1/2 of XI brown, other parts of antenna including plumose hairs largely yellow; CRL of II-X to XI-XIV 193 : 198, RL-8A 16 : 17 : 22 : 31 : 63 : 36 : 51 : 50. Thorax entirely dark, scutum with dense dark setae and microtrichia, without anterior tubercle or spine, supra-alar bristles 12-13, scutellum with 13 large and 9 small setae. Legs strongly setigerous with long bristles, largely dark but fore femur with pale yellow ring on preapical part, fore tibia with 2 pale yellow rings beyond base and before end, mid tibia with similar ring before dark end, tarsal segments of all legs I-IV pale yellow, V ochreous; dark spine-like bristles : in fore, femur with 1 apical and 3 on apical 1/2, tibia with 2 apical, tarsal segments I with 2 apical, II with 1 rather slender apical; in mid, femur with 2 apical, tibia with 2-3 on midportion and 5 on apical, I-III each with 2 apical; in hind, femur with 1 apical, tibia with 3-4 on midportion and 2 apical, I-III as in mid leg; TR and RL-L 1.96 and 53.5 : 49 : 27.5 : 14 : 8 : 4 : 8 in fore, 2.17 and 65 : 60 : 39 : 18 : 9.5 : 4.5 : 9 in mid, 2.32 and 80 : 79 : 43 : 18.5 : 10.5 : 6 : 11 in hind; claws cleft at extreme apices.

Wing very pale, almost white; costa ending before tip of M_{3+4} , CR 0.68, RL-V 52 : 54 : 62 : 21 : 32, r-m as long as basal section of Rs, M_2 subatrophyed on basal part, probably arising from end of r-m, fMCu just beyond r-m. Halter dark brown. Abdomen entirely dark. Hypopygium (Fig. 12) with tergite short, ending far before tips of coxites, with cerci obliquely truncate; sternite with shallow V-shaped caudal incision; coxite subtriangular, setigerous on mesal side and on basal part of sternal side; style very small, subtriangular, about 1/2 as long as coxite (22 : 40); aedeagus with elongate median lobe and large basal arch; parameres fused completely, far longer than aedeagus (12+54 : 10+29), ending at level of apices of coxites.

Specimen examined : 1 ♂, Kokubunji, Kitatama, Tokyo, 20-V-1962, Kitaoka.

Distribution : Japan (Honsyu).

The type specimen is slightly different from the present male in the wing venation : Rs is longer being 2 times of R_1 and fMCu is located at level of middle point of R_1

12. *Bezzia japonica* Tokunaga, 1939, Tenthredo 2 : 280; 1960, Sci. Rept. Kyoto Pref. Univ. Agr. 12 : 75. (Fig. 13)

Larva (mature) : Body about 5.69×0.29 mm, almost white and semiluculent.

Head yellowish ochreous, elongate ($285 \times 120\mu$), tapered, with mouth parts brownish. Anal segment with 8 long dark and 6 minute pale simple setae, 4 of long setae slightly shorter than anal segment ($375 : 390\mu$) and other 4 about 0.6 as long as longer setae ($225 : 375\mu$).

Pupa: Body 5.5×0.57 mm (δ) or 5.64×0.65 mm (φ), brown, structures closely as in *gracilis* Winnertz reported by Tokunaga (1939, Tenthredo 2 : 277). Operculum (Fig. 13) cordiform, weakly granulate, with sharply pointed tip, 2 delicate hairs and 2 sensory pores on either side, total length 213 (δ), - 204 (φ), median length 192 (δ)-177 (φ), basal width 201 (δ)-207 (φ). Respiratory horns dark brown, almost smooth, slightly dilated apically, with hyaline basal articulation, 23 (δ) or 20-22 (φ) respiratory pores arranged along apical part in horseshoe-shape, length 194 (δ)-201 (φ), basal width 27 (δ)-30 (φ), preapical width 51 (δ)-48 (φ). Caudal spines 2, long, longer than anal segment ($180 : 141\mu$ in δ , $168 : 147\mu$ in φ), strong, almost straight, divergent, imbricated almost entirely, sharply pointed, more or less curved inwards at dark tips.

Specimens examined: Many δ and φ , Shimogamo, Kyoto, VI-1961, Tokunaga; 1 δ , 1 φ , Kokubunji, Kitatama, Tokyo, 16-IV-1962, Kitaoka: 1 larva, 1 δ pupa, 1 φ pupa, Shimogamo, Kyoto, 25-26-VI-1961, Tokunaga.

Distribution: Japan (Honsyu).

Larvae are sluggish in movement crawling shallowly in the surface mud-layer of the paddy-field and predatory attacking small water insect larvae especially chironomid larvae. Pupae are also very sluggish floating in water.

摘 要

水 田 棲 の ス カ カ 類
徳 永 雅 明

さきにニワトリスカカ (*Culicoides arakuwae*) が水田に発生することを報告したが、今回はさらに水田表土中に棲息するスカカ類として5新種を含む12種を記述する。

Explanation of Plate

- Fig. 1 : *Dasyhelca arciforceps*, δ hypopygium.
 2 : *D. flaviventris*, δ hypopygium and parameres.
 3 : *D. centridorsalis*, δ hypopygium and parameres.
 4 : *D. densipilosa*, δ hypopygium and median lobe of parameres of paratype δ .
 5 : Same sp., φ subgenital plate and spermatheca.
 6 : *D. kitaokai*, δ hypopygium.
 7 : *Stilobezzia zonata*, δ hypopygium and parameres.
 8 : *Palpomyia ferruginea*, δ scutal integument.
 9 : Same sp., δ hypopygium.
 10 : *P. tibialis*, φ scutal integument.
 11 : *Bezzia kitaokai*, δ hypopygium and parameres with caudal tip of abdomen.
 12 : *B. spinosa*, δ hypopygium.
 13 : *B. japonica*, δ pupal operculum.

Plate I

